GENERAL SCIENCE 9 – FINAL EXAM – STUDY GUIDE

GEOLOGY

- Minerals (Chapter 2 pgs. 32-50)
  - Describe the different properties of minerals.
    Color, hardness (resistance to scratch), streak (colored powered left behind), luster (reflectiveness), crystal size/form, smell, taste, acidity, magnetism, density….
  - Which properties are good for identifying minerals? Which properties are not as useful?
    Hardness and density are good properties because they are more specific measurements. Color is not useful because a mineral can come in a variety of colors AND many minerals are similar colors.

- Rock Cycles (Chapter 3 pgs. 64-80)
  - What is a sedimentary rock? How does it form?
    A sedimentary rock is a rock that forms when sediments (produced by weather, erosion, deposition) are compacted and cemented together. Sediments can be a variety of sizes and be organic or inorganic.
  - What's an intrusive igneous rock? How does it form?
    These rocks form from cooled magma below Earth's surface. They often contain large crystals (slow cooling).
  - What's an extrusive igneous rock? How does it form?
    Rocks that form from cooled lava above Earth's surface (rapid cooling).
  - What's a metamorphic rock? How does it form?
    Form from a rock that has been exposed to heat and pressure and therefore 'MORPHED' into a new type.
  - How does the size of crystals in rock related to rate of cooling?
    Slower cooling = larger crystals. Quick cooling = small crystals. Crystals need time and space to grow!
  - Describe the processes that turn one rock into another type.
    Heat and pressure, melting & cooling, weather & erosion, deposition, compacting & cementing

- Plate Tectonics & Earth Processes (Chapters 8-11 pgs. 216-320)
  - Describe the movement at divergent, convergent & transform boundaries.
    Divergent = plates separate, convergent = plates collide, transform = plates slide past each other
  - How / where do volcanoes, earthquakes and mountains form?
    ***Divergent** = valleys, volcanoes, earthquakes / **continent to continent convergence** = mountains, earthquakes / **ocean to continent convergence** = volcanoes, trenches, earthquakes, continental volcanic arcs / **Oceanic-oceanic convergence =** trenches, and volcanic island arcs / **Transform** = earthquakes*
  - Why/how is sea-floor spreading evidence for continental drift?
    As seafloor spreads new rocks form at the divergent boundary (mid-ocean ridges) so rocks get older and older as you move out from the center toward the continents
  - What are the layers that make up Earth's interior and surface?
    Inner core (solid), outer core (liquid), mantle (plastic – can flow), asthenosphere (upper mantle + crust), lithosphere (crust or plates)
  - What is the difference between latitude and longitude? Be able to determine latitude and longitude on map / diagram. (Chapter 1 pgs. 11-13)
    Latitude is NORTH and SOUTH of the equator (0 degrees to 90 degrees north or south) 180 degrees total of latitude
    Longitude stretches from pole to pole (0 degrees to 180 degrees EAST or WEST) 360 degrees total of longitude

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METEOROLOGY

- Atmosphere (Chapter 17 pgs. 474-488)
  - Name the layers of the atmosphere and **important characteristic of each**.
    Troposphere (we live here and all weather occurs), Stratosphere (contains the ozone layer), Mesosphere (coldest layer and 'burns' meteors), Thermosphere (outermost layer, blends in with space).
  - The atmosphere is composed of what gases? What are the percentages of each?
    Nitrogen 78%, Oxygen 21%, Argon <1%, Carbon Dioxide <1%
  - Why does Earth experience seasons?
    Earth's axis is tilted 23.5 degrees toward Polaris. As Earth revolves around the Sun different latitudes receive different amounts of radiation for different amounts of time.
- Weather Patterns & Maps (Chapter 20 pgs. 556-571)
  - What are air masses and their properties?
    Air masses are moving pockets/masses of air that have properties based on where they came from. Hot & dry = continental tropical, cold and moist = maritime polar etc.)
  - Describe the different types of fronts, their formation and their symbols on a weather map.
    ***Cold fronts** are blue with spikes pointing in the direction that they are moving. They have warm air in front, cold air behind and usually bring thunderstorms.*
    ***Warm fronts** are red with semi-circles pointing in the direction that they are moving. They have cold air in front, warm air behind and usually bring long dreary rainy days.*
    ***Occluded fronts** are purple and occur when a cold front catches up to a warm front. They result in severe storms.*
    ***Stationary fronts** are red and blue with semi-circles and spikes pointing in opposite directions. This usually results in flooding.*
  - Be able to read & interpret weather maps.
- Pressure & Wind (Chapter 19 pgs. 530-543)
  - What causes wind? *The Sun heats surfaces different resulting in different temperatures. This creates a difference in pressure. Air then moves from one area to another along pressure gradients creating wind.*
  - What is the Coriolis Effect and how does it impact wind in each hemisphere?
    The Coriolis Effect is the deflection of air due to Earth's rotation. Water and air are deflected to the right in the northern hemisphere and the left in the southern hemisphere.
- Water in the Atmosphere (Chapter 18 pgs. 502-517)
  - Describe the processes that force air to rise.
    ***Orographic lifting** (air is lifted over mountains). **Frontal wedging** (warm air and cold air collide, forcing the less dense warm air up). **Localized convective lifting** (pocket of air warmed at the surface lifts as it is less dense than surrounding cooler air). **Convergence** (air masses of similar temperatures collide and are both forced upward similar to continental-continental convergence, but with air!).*
  - What must occur in order for a cloud to form?
    Temperature near the surface becomes warm which lowers the density of the air causing it to rise. As warm air rises it cools (less pressure, expansion, cooling). As air reaches is dew point water vapor condenses onto condensation nuclei which cause a cloud to form.
  - What is relative humidity and how is it impacted by temperature?
    Relative humidity is the ratio of water vapor present in the air compared to how much water vapor would be needed to saturation at a given temperature/pressure. Warm air "has more room" (not really a space issue, just a difference in the amount of net evaporation/condensation processes) for water vapor than cold air. As air warms, relative humidity decreases. As air cools, relative humidity increases.
- Heat Transfer & Climate (Chapter 17 pgs. 474-488)
  - How do conduction, convection & radiation transfer energy throughout Earth and the atmosphere?

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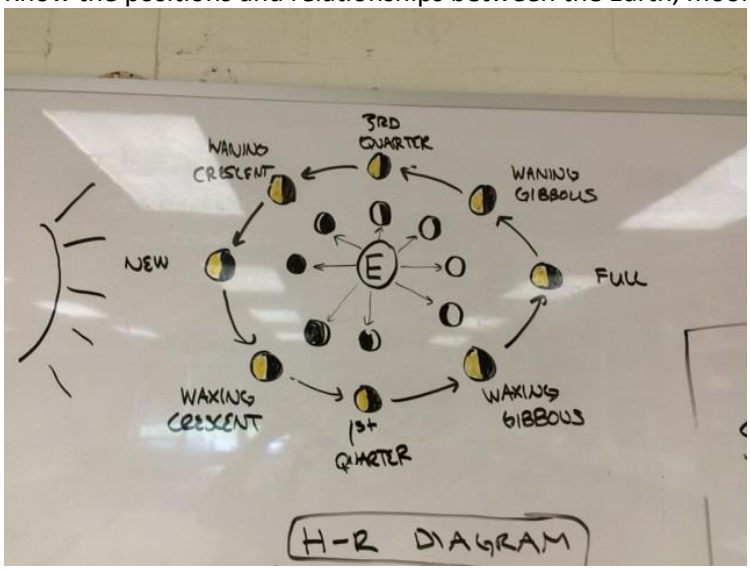
Conduction is through direct contact, occurs mainly at Earth's surface. Convection = warm air rises, cool air sinks causing circulation, occurs throughout the atmosphere. Radiation can travel through space, incident energy arriving at top of atmosphere; also Earth's surface radiates long-wave infrared radiation at night.

- Be able to describe all of the parts of the energy budget. (see page 486)
  Clouds, atmosphere, various Earth surfaces, albedo, etc.

- What are greenhouse gases? What role do they play in climate? Be able to give examples. (See pgs. 600-603
  Greenhouse gases are good at absorbing OUTGOING LONGWAVE INFRARED RADIATION FROM EARTH. They cause temperature to warm near Earth's surface. Examples include: carbon dioxide, water vapor, methane, nitrogen oxide, CFC's (not a greenhouse gas – molecules that break apart ozone), ozone, etc.

ASTRONOMY

❖ Earth, Moon, Sun (Chapter 22 pgs. 622-634)
- What are the moon phases? Be able to identify phases on a diagram.
- Know the positions and relationships between the Earth, moon and the sun



- What is the difference between revolution & rotation of Earth around the Sun AND the Moon around Earth?
  Rotation = spinning on axis (Earth = 1/ day, Moon= 1/ month)
  Revolution = orbiting around another object (Earth around sun= 1/year, Moon around earth= 1/month)
- Describe what is happening in the Sun and how that relates to features and process occurring on its surface.
  Nuclear fusion in the Sun's core creates energy which travels out through the radiative zone and then through the convective zone which eventually brings the energy to the surface. Once the energy reaches the surface, features and solar wind carry energy to Earth.

❖ Gravity (pgs 620-621 and handouts)
- What is the relationship between mass and gravity? *More mass = stronger gravity, less mass = weaker gravity*
- What is the relationship between distance and gravity? *Larger distance = weaker gravity, shorter distance = stronger gravity*
- Be able to calculate gravity using formula $F = Gm_1xm_2/r^2$

❖ Stellar Evolution (Chapter 25.2 pgs. 707-714)

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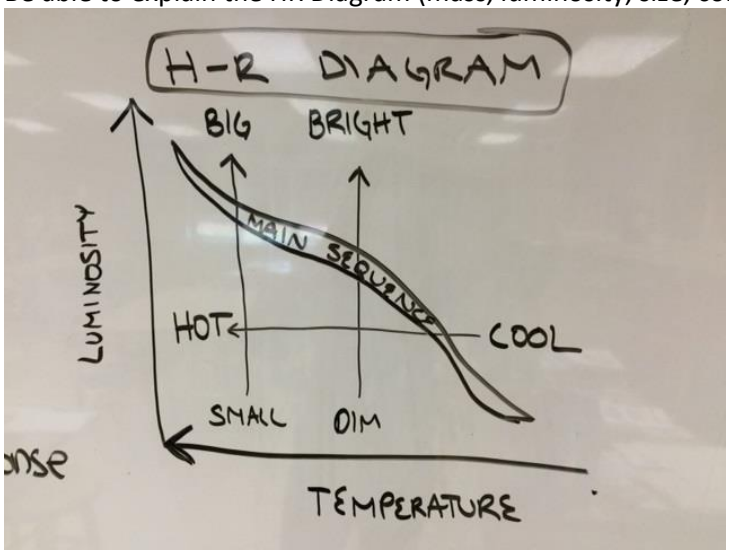
- Be able to explain the HR Diagram (mass, luminosity, size, color, temperature, spectral class).



- What is the life cycle of a low-mass, medium-mass and massive star?
  All stars begin as nebulae. Dust and gas begin to condense and heat. Once nuclear fusion begins a star becomes a main sequence star.
  Low mass = main sequence -> red dwarf -> black dwarf
  Medium mass = main sequence -> red giant -> planetary nebula -> white dwarf -> red dwarf -> black dwarf
  Massive = main sequence -> supergiant -> supernova -> supernova remnant OR collapse into black hole OR neutron star

❖ Stellar Properties (Chapter 24.1 pgs. 674-679 and 25.1 pgs. 700-706)

- What is the Doppler Effect and how is it used to determine speed and direction of objects in space?
  If an object is moving closer, wavelengths are shortened and spectral lines shift toward the blue end.
  If an object is moving away, wavelengths get longer and spectral lines shift toward the red end.
- Be able to identify composition of stars using spectral analysis.
  Compare spectral lines of a star to spectral lines of elements. Match up lines to determine if the element is present in the star.
- What are the types and properties of electromagnetic radiation?
  Shortest wavelengths -> longest wavelengths = Gamma, X-ray, UV, Visible, Infrared, Microwave, Radio
- Be able to describe the process of nuclear fusion.
  Due to intense heat and pressure, hydrogen protons collide in a series of reactions called the proton-proton chain to produce a helium nucleus and energy.

ECOLOGY

❖ Introduction (Chapters 1, 4, 6, and 7)

- What is the different between biotic and abiotic factors? Be able to provide examples of each.
  Biotic is living or once living or from a living thing. Abiotic is non-living.
- What are the different levels of organization for life on earth?
  Largest to smallest = biosphere, biome, ecosystem, community, population, organism.
- What the main biomes of Earth? Describe the temperature, precipitation and types of life for each.
  Desert = hot and dry, few small plants, not much biodiversity (Tropical vs. Temperate)
  Tundra = cold and dry, few small plants, not much biodiversity
  Rainforest = warm and wet, lots of vegetation and very diverse (Tropical vs. Temperate)
  Temperate Forest = large range of temperatures with an average amount of precipitation (we live here)

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Tiaga = cold but not as dry as tundra, pine trees that can withstand cold
Grassland = temperature climate (cold winters, warm summers) with slightly more precipitation than desert (Tropical vs. Temperate)
Chaparral
Mountains
Polar Ice
Aquatic Biomes = Freshwater lakes/ponds/rivers, Freshwater wetlands, Saltwater Coastal wetlands, Ocean, Coral Reef

- Energy in Ecosystems (Chapter 5)
  - Be able to identify and analyze food webs.
  - What are trophic levels and how much energy is transferred from one level to the next in an ecosystem? *Producers, primary consumer, secondary consumer, tertiary consumer. 10% of the energy is passed from one level to the next. 90% is lost.*
  - What are producers and why are the important? *Producers can create their own energy through the processes of photosynthesis. They are important because they provide all of the energy for the ecosystem.*
  - What are the different types of consumers? Give examples of each. *Herbivore (plant eater), Omnivore (plants & animals), Carnivores (only animals), Decomposers (break down dead organisms)*
- Limiting Factors (Chapter 8 and Chapter 5.3)
  - How does population growth (exponential and logistic) look what graphed? What is carrying capacity? *Exponential grows continually. Logistic grows but levels out. Carrying capacity and the max # of species that can exist in an ecosystem.*
  - Give examples of biotic & abiotic limiting factors in ecosystems. *Abiotic = sunlight, temperature, wind, water*
    Biotic = bacteria, competition, predators
  - What is ecological succession? Name the 2 types and describe the different stages of succession. *Ecological success is the development of an ecosystem over time. Primary succession is a BRAND new ecosystem and is developing 'from scratch'. Secondary succession is an ecosystem that is redeveloping after a disturbance. Ecosystems start with small plants that don't require soil. As time goes these add nutrients to the soil and bigger move developed plants can grow.*
- Biodiversity (Chapter 10)
  - What does a stable ecosystem look like? What are different ways that animals move between ecosystems? *The more diverse the ecosystem the more stable it will be. Organisms can move from one ecosystem to another through immigration, wind & water, invasive species.*
  - What are ecological hot spots and why are they important? *These are small areas (typically near the tropics) with very high biodiversity. They contain most of the species on earth so are important to the biodiversity of Earth.*
- Cycles of Matter (Chapter 5.2)
  - Describe the importance and processes/stages in the carbon, nitrogen, water and phosphorus cycles. Study cycles of matter diagrams from online Environmental Science Textbook